REQUEST FOR APPLICATION (RFA)
Greenhouse Gas Technology Pilot

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY (NRMRL)
AIR POLLUTION PREVENTION AND CONTROL DIVISION (APPCD) (MD-49)
Research Triangle Park, NC 27711

VERIFICATION TESTING OF GLOBAL CLIMATE CHANGE TECHNOLOGIES
(May 21, 1997)

Attached is a Request for Application. An offeror must submit the Application (original plus 10 copies) so as to be received by Close of Business (5:00 p.m. Eastern Daylight Time) on July 15, 1997.

The Application should be sent to:

Malcolm P. Huneycutt
U.S. Environmental Protection Agency
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division (MD-49)
Research Triangle Park, NC 27711

An applicant must also send one copy to:

U.S. Environmental Protection Agency
Grants Operations Branch (3903F)
Grants Administration Division
401 M Street, SW
Washington, DC 20460

An application received after the above time and date will not be considered unless there is clear evidence that the application was mishandled by EPA after its timely receipt.

Questions regarding this RFA should be directed to Malcolm P. Huneycutt at (919) 541-2903 and will be addressed only if received on or before June 25, 1997.

COOPERATIVE AGREEMENT OBJECTIVES

INTRODUCTION:

In February of 1993, President Clinton outlined his Environmental Technology Initiative (ETI) during his State-of-the-Union address. The goal of ETI is to

spur the development and use of innovative environmental technologies to protect the environment and enhance the competitiveness of the Nation's environmental technology industry. To help facilitate ETI goals, the ETV program has been established to accelerate the development and use of environmentally beneficial technology by systematically evaluating, verifying, and broadly disseminating information on the performance and cost of environmental technologies. EPA's goal in this program is to establish long-term relationships with technically outstanding organizations to carry out performance verifications in all areas of environmental technologies; e.g., air pollution prevention and control, air emissions monitoring, and hazardous waste treatment. The ETV program has begun with a number of three-year pilot verification programs in order to evaluate the efficacy of alternative approaches. (All of the pilots in this program will be monitored throughout the three-year period and evaluated under specified criteria.) These three-year pilot programs address several specific environmental technology areas in which the technologies will be tested by third party (other than EPA) organizations and performance reports issued by the third party organizations. Additional information on the ETV program can be found in a publication entitled Environmental Technology Verification Program: Verification Strategy (EPA/600/K-96/003) and at the ETV website (http://www.epa.gov/etv).

In this pilot, the Agency seeks a private sector (non-profit or not-for-profit organization) applicant who will independently (subject to prior noted EPA review and concurrence items) design and operate a verification program for technologies and processes that could be used domestically and internationally to reduce Climate Change emissions; i.e., Greenhouse Gas (GHG) emissions and precursor emissions. One or several stakeholder groups which include representatives from industry, other Federal agencies, trade associations, and internal organizations will be formed to help decide on which areas to focus. The overall goal of any of the technology areas chosen is to clarify the environmental and performance capabilities of the technologies. Also the potential capital and operating costs are to be estimated for potential buyers where results can be readily obtained and would be meaningful in order to provide market impetus to utilize them. For example, biomass direct utilization represents a large worldwide source of pollutants with many different designs that can be used with many different fuel types. Any biomass technology that lives up to low-polluting claims can make a significant difference in global emissions. While the actual scope of work would address the broader area of global climate change technologies the material below gives examples in only a limited number of technology areas.

The IPCC (Intergovernmental Panel on Climate Change) has evaluated the latest scientific evidence and concluded that the balance of evidence suggests a discernible human influence on global climate. Furthermore, the Science Advisory Board has indicated that some risks are potentially so serious, and the time for recovery so long, that risk reduction actions should be viewed as a kind of insurance premium and initiated in the face of incomplete and uncertain data. These statements are partly based on evidence that the concentration of some climate change drivers such as carbon dioxide and methane, the two most important GHGs, are increasing exponentially in Earth's atmosphere as a result of human activities. The verification program proposed would include technologies that could be applied across many economic sectors to reduce GHG emissions.

Environmental Needs. Recent understanding of the global climate change issue has resulted in heightened awareness that a problem will occur, and it is only the magnitude of the problem that is in doubt. This has prompted the United States to pursue mandatory emission targets for GHGs. Because the emission sources are so numerous and diverse, a wide variety of prevention and control technologies will be needed to solve the problem. The IPCC has reported that atmospheric concentration of GHGs have grown significantly since preindustrial times (~1750 AD) and these trends are largely due to human activities, mostly fossil fuel use, land-use change, and agricultural. There are a variety of technologies that could be utilized or modified to result in reducing GHG emissions and help meet the goals of recent discussions to set emission targets for GHGs.

Methane is considered to be an initial focus of the verification effort because, after carbon dioxide, it has the most significant impact on warming (approximately 20 times

the direct global warming potential of carbon dioxide per cubic foot over a 100 year time period). Reducing methane emissions today can make quick progress (as compared to other GHGs) towards slowing global climate change. In addition, many of the sources are amenable to cost-effective control. Methane sources include: (1) waste disposal which includes landfills, wastewater, and septic sewage; (2) fossil fuel sources (coal, oil and natural gas); and (3) small-combustion devices including charcoal kilns and cookstoves. These sources also can emit other pollutants including volatile organic compounds (VOCs), hazardous air pollutants, nitrogen oxides, criteria pollutants, and waterborne pollutants. Municipal solid waste landfills are the largest single source of methane emissions in the U.S. and have been targeted for reductions through the Clean Air Act. This source has been estimated by EPA to contribute 14% of total annual anthropogenic methane emissions globally (i.e., ~50 teragrams/yr). The largest collective source of anthropogenic methane emissions, both in the U.S. and globally, are the fossil fuel industries: coal, oil, and natural gas. The natural gas industry in the U.S. contributes emissions of 314 billion standard cubic feet/yr or more than 6 teragrams/yr and much of this lends itself to mitigation through technology. The combustion of biomass as fuel in small combustion devices is a highly significant internationally, particularly in developing countries. Close to one-fifth of total world energy demand comes from such devices burning biomass or coal. In developing countries, the fraction is substantially higher. In India and China, for example, well more than one-third of all fuel use still occurs in such situations. Nearly 60% of all households use such fuels, mostly in developing countries and mostly (80%) as biomass. Small-combustion devices tend to be highly inefficient. Recent research indicates that 6 to 16 % of the fuel carbon is released into products of incomplete combustion (PIC) that include tropospheric ozone precursors, carbon monoxide, and nitrous oxides - all important GHGs.

Business Opportunities. With the public awareness that will be increasing at an ever faster rate with the coming of mandatory emission targets, both technically sound and charlatan fixes are likely to be offered for prevention and control of these sources and gases. It will be difficult for users to differentiate between the two and even more so among competing technically sound approaches that have different effectiveness or costs. Innovation is likely to be rampant, and the successful entrepreneur is likely to have major markets open for it with large economic benefits. Successful emission reduction technologies will not only have a viable U.S. market but will have an upper hand in the international arena as well. Timing is important since it is not always the best technology that is successful but often the first technology. This effort is an opportunity to have the first verifiable technologies to address these important areas. Waste methane from all waste accounts for about 70 teragrams (20% of world wide emissions) of methane emissions. In the U.S., landfill sites that will have to control the emissions due to the most recent regulatory requirements are expected to increase from 200 to over 700. Each site will have to make decisions as to the appropriate technology to use. Waste methane emissions from the natural gas industry were 314 billion standard cubic feet in 1992. Since then, EPA's natural gas STAR program has eliminated some emissions. There is an abundance of hardware that would allow companies to further reduce or eliminate certain categories of emissions when replacing parts during maintenance. The performance of

most of this equipment has not been tested impartially. Such an evaluation would be expected to increase the industry's use of improved equipment rather than continuing to use what was used before. This would strengthen the STAR program and its ability to achieve greater reductions of methane emissions. In direct biomass conversion, it is estimated that there are about 50 small combustion device/fuel combinations that would be ready for testing that are intended to replace older combinations now in use. These are in use throughout the world and especially in developing countries such as India, China, Thailand, and the Philippines where EPA has done some emission characterization work on these devices and charcoal kilns. There is a strong international market for these technologies.

Multiple Developers and Vendors. Each source and GHG will have a different array of developers and vendors. It is expected that a verification program will catalyze innovation among existing vendors and bring out new vendors who might now see a level playing field for their technologies.

Range of Environmental Media. Global climate change would be a new area for verification. As such it opens the door for interactions with different parts of Program Offices, Regions, and Enforcement functions within EPA. In addition, many sources of the GHGs of concern in the verification program will contain multiple pollutants of environmental concern. These include volatile organics, nitrogen oxides, particulate matter, and air toxics. All of these will be evaluated in the verification program although the main intent of the technologies will be to prevent or control climate change emissions.

APPLICATION THRUST:

FOCUS: The primary focus of applications should be on establishment, execution, and implementation of a pilot program for verification testing of selected categories of commercialized and near-commercialized technologies which can be used domestically and internationally to reduce climate change emissions. Emphasis should be on the performance and cost of specific vendor-provided systems. The application should clearly define the applicant's approach for: establishing stakeholder groups to provide guidance in conjunction with EPA identified potential stakeholders [Note that EPA will announce this program in the CBD for the specific purpose of soliciting contacts with parties potentially interested in becoming stakeholders. The Agency will make the resulting list of contacts available to the cooperator, and reserves the right to recommend the inclusion of selected stakeholders which the Agency believes would benefit the program.]; prioritizing of technology areas; developing appropriate test protocols; soliciting and selecting candidates for testing; performing the verification testing; documenting and publicizing the results; ensuring acceptance of results by a wide range of users and regulatory authorities; and achieving long-term self-sustainability of the

verification program. The proposed role of the technology vendors in performing and funding the testing should be clearly defined. Applications should also present a plan to privatize the verification program as efficiently, effectively, and timely as possible, evolving into a program that will operate on program-generated income and leveraged resources.

ORGANIZATION: NRMRL desires to allow flexibility in the structuring of the program and the execution of the approach described in the application. Various types of organizational structures are possible as long as the appropriate expertise is incorporated into the effort and representatives of all the major stakeholder groups provide continued input/feedback in the verification program's planning, review, and execution.

ACTIVITIES: The applicant should propose a variety of specific project activities which will facilitate the development and implementation of a pilot verification program for climate change technologies. Some key elements of a verification program that need to be considered include:

Technology Area Selection and Prioritization. There is a wide range of technologies that reduce climate change emissions that might be selected for verification. The limited resources for protocol development and testing requires a targeted approach to selection of technologies for verification. The applicant should consider methodologies for prioritizing the technology areas. EPA has determined the following areas to be high priority partly because these areas are thought to have a high probability of success:

(A) A variety of technologies for the collection, extraction, and control/utilization of landfill gas emissions through the utilization of methane to displace use of fossil fuel in boilers and other direct-gas utilization process or used in processes to produce vehicular fuel and/or to produce electricity. Potential verification of these technologies could result in less costly testing requirements in future permitting of landfill gas control where emission reduction capability and potential for byproduct emissions is established through this program. Methane, carbon dioxide, other GHGs, and precursors to tropospheric ozone including NOx, particulate, VOCs, and criteria pollutants all can result from landfilling solid waste and combustion of landfill gas.

(B) The natural gas industry has shown itself to be proactive in the emissions reduction area through its voluntary participation in EPA's Natural Gas STAR Program and in the EPA/ORD study of methane emissions from the natural gas industry. Numerous opportunities exist within the gas industry to reduce emissions of methane and VOC. Improved components and control devices are available for demonstration as are methods for improved leak detection and facilities' emission screening.

(C) Small combustion devices such as the use of cookstoves and charcoal kilns which are widely used in developing countries contribute emissions of methane, particulate, and VOC. To date, ORD/NRMRL through a cooperative agreement with the East-West Center has conducted measurements of small-combustion devices including charcoal kilns and cookstoves used for heating and cooking food in China, India, the Philippines, and Thailand. Verification of improved stove designs and fuels could help in establishing the potential reduction in emissions from the use of conventional stoves and fuel types in use in applications worldwide.

If the applicant has a different suggestion for prioritization than the preliminary recommendation of EPA, the proposal should clarify the basis for the ranking and provide justification for the ranking. Justification for a ranking should be provided even if the applicant's ranking is consistent with the Agency's preliminary high priority areas.

Other areas to be considered now, or that may be more of a focus in future years, include but are not limited to: use of low total-equivalent-warming- impact refrigerants such as in supermarkets, refrigerator/freezers, and space cooling; biomass conversion technologies such as boilers and gasifiers; wind turbines; intelligent controls such as fuzzy logic controllers on motors; technologies that can be used to reduce emissions from coal mines, facultative lagoons used for wastewater treatment or septic sewage disposal; or other areas where new technologies can be readily employed to prevent or control climate change emissions.

A stakeholder group with broad knowledge of technologies for reducing climate change emissions could be convened to provide advice as part of the prioritization process. The use of life-cycle thinking (e.g., consideration of all discharges from raw materials through final disposal) to evaluate technologies should also be considered.

Protocol Development. An appropriate number of verification protocols should be developed for the selected technology area. The protocols should consider the performance of the technology in addressing the pollutant(s) of concern, evaluation of undesirable byproducts, and estimation of capital and operating costs of the technology. The protocol should establish the range of applicability of the technology. It should also contain quality assurance (QA) measures which will provide data of known quality for the design of rules, regulations, or policies as would be pertinent to decision-making or standard setting (See also **EXHIBIT F**).

Verification Testing. The key to a successful verification program is providing a testing approach that provides effective and efficient performance evaluation. The applicant should identify the specific approach to verification testing, including necessary facilities, personnel, and experience. Specific issues that should be addressed include, but are not

limited to, the location of the testing (e.g., field, laboratory), the role of the vendor, the anticipated cost per test, the apportionment of the cost of testing between the verification center and technology vendor, the specific testing to be performed, and the roles of personnel performing the testing.

The EPA facilities that could be made available include two environmental chambers (9x8x8 ft; 2.7x2.4x2.4 m) that can control the ambient conditions (temperature 60 to 120ºF; 16 to 49ºC and relative humidity from 30 to 95%) under which refrigeration equipment (refrigerator/freezers and supermarket display cases) operate, a compressor calorimeter (capacity from 250 to 10,000 Btu/hr; 70 to 2930 W) which has been modified to handle low-pressure refrigerants, and an instrumented motor vehicle air-conditioning system. Personal computer based data acquisition systems are available for the chamber and motor vehicle air-conditioning systems tests.

Documentation of Results. The anticipated benefit of technology verification is widespread acceptance of the data by users and regulatory agencies as an authorization basis for technology selection. The applicant should identify the approach to be used to document the results and to provide a verification statement that the vendor can use to interact with potential customers. The documentation should clearly delineate the limits of the performance verification and specific applicability of the technology (e.g., types of sources, pollutants, range of concentrations).

Reciprocity. The value of a technology verification statement will be dependent on widespread acceptance by equipment purchasers and Federal, state, and local regulatory authorities, especially permit writers. The applicant should be aware that there are a number of efforts, both within and outside of EPA, to achieve reciprocal acceptance of performance data. The applicant should define the approach to interfacing with the appropriate groups to participate in the reciprocal acceptance process. For example, the results from the verification testing would be provided for inclusion in data used to develop factors for emission inventories on emission reduction capability and potential for byproduct emissions that are used in permitting.

Self-Sustainability. The ultimate goal is to establish a verification entity with outstanding credibility, recognition, and value such that long-term self-sustainability can be established. The applicant should propose a strategy that progressively increases the level of vendor cost sharing over the three-year verification program and provide a scenario for achieving self-sustainability within a 3 to 5 year time frame. This strategy should clearly state the basis for projected revenue increases and for assessing the credibility of the projection.

SUCCESS MEASURES: The Application should identify measures of success for the pilot verification program. Such success measures could include: organization and partnerships; leveraging of funds; obtaining stakeholder input; development of testing protocol(s); the quantity and diversity of products tested in the program; quality assurance/quality control (QA/QC) procedures for testing and dissemination of information; benefits to manufacturers/vendors, regulators, and technology users; and program sustainability after EPA funds are expended via evolution to a privatized verification program.

III. SELECTION FACTORS

The following five selection factors in Table 2 will be used by NRMRL to evaluate each of the applications. All applicants are advised to give careful consideration to these selection factors when preparing their applications. Failure to adequately address any selection factor may be cause for rejecting the application. The relative importance of each selection factor is indicated by the number of points assigned to it.

Selection Factor Points

Table 2. Selection Factors and Points Assigned to Each

1.	Quality and innovativeness of a technical program approach as well as the rationale for selecting technology area(s) to be evaluated with substantiating information or data which integrates high testing credibility with economical and efficient operation a. Technology area selection and prioritization (10 points) b. Technologies solicitation and selection (10 points) c. Reciprocity (10 points)	30
2.	Qualifications of the applicant (including knowledge, experience, and expertise of the proposed program personnel) to effectively conduct and manage equipment test projects both in the laboratory and in the field a. Development of protocols with quality assurance	40

	provisions (10 points) b. Verification testing (10 points) c. Operating capability (10 points) d. Facilities and equipment to conduct program (10 points)	
3.	Proposed mechanism for selecting stakeholders, preliminary suggested list, and making use of their input	10
4.	Thoroughness of the proposed management and marketing approach	10
5.	Detail and completeness of the proposed program budget and financial contribution of the applicant	10
	TOTAL POSSIBLE POINTS	100

Explanation of Selection Factors:

1. Quality and Innovativeness of the Technical Program Approach

The applicant must describe ORGANIZATION, FOCUS, ACTIVITIES, and SUCCESS MEASURES for the proposed effort. The application will be evaluated on the quality of the technical approach and the innovativeness that will be used. The applicant should be particularly responsive to the items in ACTIVITIES that appears under **II. COOPERATIVE AGREEMENT OBJECTIVES.** The applicant should identify any overlap or duplication between the proposed program and similar ongoing programs. The identification of significant differences from other verification/certification programs needs to be discussed.

The evaluation under Selection Factor number 1 will specifically consider the following:

- Technology area selection and prioritization

This activity will lay the groundwork for all subsequent aspects of the pilot verification program. The applicant should discuss all factors that will be used to select technology areas to be verified and to prioritize the order in which the protocols and testing will be implemented, including: importance of environmental problem; availability of technologies to be verified; potential market for technology to be verified; potential for achieving self-sustainability;

participation of stakeholder groups; and any other relevant factors.

- Technologies solicitation and selection

Within each technology area, the applicant should describe key elements of the process that will be used to solicit vendor interest in having technologies verified, the application process the vendor will need to follow, the decision-making process to prioritize the proposed technologies, and the proposed formula for cost sharing. Particular emphasis should be placed on the methodology to be used if the number of technologies exceed the available resources for verification testing.

- Reciprocity

The approach to verification statements should be discussed, with special emphasis on achieving widespread acceptance of results by vendors, users, and regulators.

An applicant should state the specific, individual objectives of the proposed program and what purpose and benefits the public, the applicant, and/or the environment might obtain from the pilot program.

2. Qualifications of the Applicant including Knowledge, Experience, and Expertise of the Proposed Program Personnel:

The success of this effort will be predicated on the capabilities of the applicant in the areas of technical and management knowledge and experience concerning technology evaluations, particularly those related to evaluating Climate Change technologies. The applicant should convey these capabilities in the application. The applicant should also provide documentation of the qualifications of the Project Team (e.g., knowledge, experience, expertise), including team members having conducted similar types of activities in related areas. The applicant should describe and discuss the extent to which the time of each of the team members will be dedicated to the program or project and

their specific duties related to the program.

The narrative statement on quality assurance in the Cooperative Agreement Application should be adequate for the proposed verifications [detailed in the section on QUALITY ASSURANCE in the APPLICATION FOR FEDERAL ASSISTANCE (STANDARD FORM 424); see also 40 CFR 30.503].

The evaluation under this Selection Factor will specifically consider the following:

Protocol development

The testing protocols must satisfy two factors as a minimum: the resulting data must support a full evaluation of the performance and cost of the technology under specified conditions and the approach should be supported by a consensus of key stakeholder groups and/or by recognized organizations that support testing standardization (e.g., ANSI/ASTM). The applicant should identify their experience or current involvement in development of protocols and/or consensus test methods.

Verification testing

The success of the program will ultimately depend on the thoroughness and credibility of the verification testing. The applicant should fully describe the approach to testing, including areas such as: selection of test location, methods to be used, data quality objectives, role of vendors, approach to assess complete environmental impacts of the technology, approach for establishing capital and operating costs for the technology, approach to ensuring data quality, estimated cost for each complete verification test by technology area, expected cost share of vendor, and expected documentation of results.

Operating capability

The applicant should demonstrate the capability to perform the verification testing by discussing factors such as: background and experience in conducting laboratory and field testing, experience in quality assurance, laboratory and field measurement capability to perform the testing, qualification of proposed personnel, anticipated composition of the team needed to perform the testing, and the requirements to contract any part of the testing to other organizations along with the proposed mechanics (e.g., sole-source, competitive) to do so.

Facilities and equipment to conduct program

The applicant should indicate the facilities that are intended to be used for the testing (where these are known) and their capabilities to achieve the desired results. Where facilities commitments are not firm, a plan should be proposed that indicates how facilities are intended to be obtained as they are needed. This plan may include private, public, or other facilities and should include a rationale for their use.

3. Proposed Mechanisms for Selecting Stakeholders, Preliminary Suggested List, and Using Their Input:

In order to garner support, trust, and credibility among potential clients (i.e., private sector users and government regulators), the applicant should be well established - or show how they will attain such status - with an impeccable reputation for technical excellence in testing climate change technologies and fairness and have established relationships with the major stakeholder constituency group(s).

The applicant should clearly convey that stakeholder group(s) exist, or

can readily be formed, and that this relationship has the potential to be long-lasting and productive. The applicant should provide evidence that the proposed relationship of representatives of the major stakeholder constituency group(s) is predicated on the willingness of all individuals to provide useful and worthwhile input for the successful execution of the effort.

4. Thoroughness of the Proposed Management and Marketing Approach:

The applicant should document a systematic and realistic plan for managing both the technical and financial aspects of the project. Such an approach ensures that there is accountability in terms of both the project's technical and budgetary components. The applicant should avoid excessive management which reduces funding available for verification projects. The management plan should present a course of action that will lead to increased independence in operating the verification program as EPA funding is completed. The goals and objectives should lead to the efficient and effective evolution of the pilot program over a reasonable period to an independent privatized verification program that will operate on revenues generated by program user fees and supplemented by additional leveraged resources. The applicant must document the basis for revenue projections to lend credibility to these estimates. Strengths and weaknesses need to be discussed as related to the probability of achieving the stated objectives within the time

proposed.

5. Thoroughness of the Proposed Program Budget:

The applicant must provide estimated costs for the pilot program including, *but not limited to*, equipment, labor, sampling and analysis, QA/QC reporting, contracting, and travel. The applicant should carefully structure management to maximize use of available funds for pilot testing. The applicant should also estimate the funds to be expended on major activity categories, such as verification testing, protocol development, stakeholder group activities, and management. The project budget should clearly delineate the projected cost for each test of a candidate technology and estimate the number of tests that can be accomplished during the course of the pilot program. The budget should be presented in the format specified on the Application Form. Applicants are reminded that project costs are to be shared by EPA and the Cooperator in a Cooperative Agreement. (See **EXHIBIT E** for ways by which an Applicant may cost share in an EPA Cooperative Agreement). Applicants may submit budgets that present cost shares greater than the 5% minimum amount, including both financial and in-kind resources from stakeholder partners. The approach to increasing the cost sharing from non-EPA sources during the period of the cooperative agreement should also be addressed as an indication of the ability to achieve self-sustainability. The applicant should succinctly discuss the basis of estimates in order to support the credibility of the approach.

The Cooperative Agreement Application will be chosen for funding based on all selection factors listed above. NRMRL reserves the right to reject any or all Cooperative Agreement Applications based on technical and financial review or due to insufficient EPA funds.